General Notes.

GEOLOGY AND PALEONTOLOGY.

Trans-Pecos Texas.—The studies of Mr. Streeruwitz in western Texas have developed some interesting facts from both a scientific aud economic standpoint. The rocks are mostly older and newer eruptives and various metamorphics; the sedimentary, as now known, reach from the Silurian to the Cretaceous period, and Cenozoic deposits are probable. The petrography of the Igneous rocks has been reported upon by Mr. A. Osann in the Ann. Rept. for 1892, Geological Survey of Texas. The results of his examinations show the great diversity of the character of the rocks prevailing in the different mountain ranges and the great difference in time and conditions of their origin.

Mr. Streeruwitz finds that the disintegration of the rocks in Trans-Pecos Texas is mostly the result of the rapid changes of temperature and deflation, the same forces active in the desert of Sahara. The rains are also the cause of another source of disintegration causing that peculiar shape of granite blocks peculiar to the Sahara called "Pilzfelsen." Chemical action manifests itself in the formation of rows of caves in the stratified granular rocks similar again to the African deserts.

The prevalence of ozone in West Texas is explained by the author as the result of the friction of the drifting sand grains among themselves and along the surface of the soil and the rocks, which creates sufficient electricity to ozonize the oxygen of the atmosphere.

In regard to the ores, Mr. Streeruwitz reports that the most of the mountain ranges of Trans-Pecos Texas are ore-bearing. These ores are of excellent quality and exist in paying quantities, along with building stones and material for art and decorative work, not to mention agates, sardonyx, opals and other precious stones. The difficulties in the way of mining these products are pointed out and ways of surmounting them suggested by the writer. Under existing conditions the mountain land of this region is practically valueless, and for lack of irrigation the flats are becoming less fertile from year to year. (Fourth Ann. Rept., 1892, Geol. Surv. Texas, Austin, 1893.)

Estimates of the Duration of the Glacial Epoch.—At a recent meeting of the Geological Society of America, Mr. Warren Upham

showed by a comparison of the shore erosion and accumulation of beach gravel and sand by the waves of Lake Agassiz with those of Lake Michigan that the existence of the former might be estimated at not more than 1000 years; the moraines belonging to the area of the later drift were probably formed in twice that time; the recession of the ice from its outermost limit to the first of these moraines a similar length of time, or perhaps, longer. In these conclusions the author agrees with Prestwich, who estimates the epoch of extreme cold at 15,000 to 25,000 years, and the melting of the ice-sheet to from 8,000 to 10,000 years or less.

In order to show that his conclusion as to the age of Lake Agassiz is consistent with the known records and inferred conditions of the Ice age upon the central belt of the North American continent, Mr. Upham reviews the series of formations in the Mississippi and Nelson river basins which belong to the times immediately preceding, during and following the Glacial period, especially considering the changes in the altitude and slopes of the land and the probable measures of time demanded by the processes of drift transportation and deposition, by subsequent weathering with soil formation, and stream erosion. As a result of his investigations, he gives the following estimates of the duration of the three parts of the Cenozoic period under study, arranged in chronological order:

"The time of preglacial epeirogenic elevation, with the deposition and erosion of the Lafayette beds, some 60,000 to 120,000 years; the Glacial period, regarded as continuous, without interglacial epochs, attending the culmination of the uplift, but terminating after the subsidence of the glaciated region, 20,000 to 30,000 years, and the Postglacial or recent period, extending to the present time, 6000 to 10,000 years. In total the Plistocene era in North America, therefore, has comprised probably about 100,000 or 150,000 years, its latest third or fourth part being the Ice age and subsequent time. The pre-plistocenic Cenozoic era appears by changes of its marine molluscan faunas to have been vastly longer, having comprised, perhaps, between two and four million years, of which the Pliocene period would be a sixth or eighth part, thus exceeding the whole of the ensuing era of great epeirogenic movements and resulting glaciation."

In the discussion which followed the reading of Mr. Upham's paper, Mr. McGee called attention to the unmistakable unconformity between the Columbia and Lafayette formations in the Coastal plain series. This unconformity represents erosion approaching 1000 feet in depth in the Lower Mississippi region and from 300 to 500 or more feet in depth in

the embouchures of the other rivers of the Coastal plain. It is represented not only by the removal of fully one-half of the original volume of the Lafayette formation, but by the degradation of an equal or greater volume of subjacent formations of Neocene, Eocene and Cretaceous age beneath. (Bull. Geol. Soc. Am., Vol. 5, 1894.)

In a previous publication in the same periodical, Mr. Upham had concluded that the observed volume of the Plistocene glacial erosion and resulting drift had probably accumulated in from 10,000 to 20,000 years. In the general conclusion of a short rather than a long period, Mr. R. S. Tarr agrees, but cannot accept Mr. Upham's line of argument, with our present knowledge of the rate of glacial erosion. Various complex factors make a time estimate of little value. Mr. Tarr bases his estimate on the following conditions.

A glacier is supplied with material for erosive work in three ways: (1) it may carry along the loose material in its path; (2) it may rend rocks asunder whenever a place of entry is found; (8) it may obtain material from the rock itself by scouring it with cutting tools already supplied. The erosive action of ice is to round, smooth and polish the surface over which it moves, lessening the possibility of obtaining a supply of cutting tools, so that as the period of ice occupancy lengthens the power of erosion diminishes.

With these facts as a basis, a young glaciated region should be littered with glacial drift, the products of disintegration. In a later stage the deposits would be composed of fresher rock fragments distributed in greatest abundance near the periphery of the ice-sheet. During old age the country would be free from deposits and the topography would consist of polished, rounded hills of glacial erosion. The first stage would be brief, the second longer, and the passage to extreme old age one of slow development.

In accordance with these facts, Mr. Tarr concludes that the North American glaciated region is topographically young, or at most not far advanced into maturity. (Am. Geol., Vol. XII. 1893.)

Geology of Marthas Vineyard.—After a personal investigation of the geology of Marthas Vineyard, Mr. Hollick finds that the ridge of hills consisting of a superstructure of contorted clay strata capped and flanked to the north with till, is composed of material derived from cretaceous and post-cretaceous strata. He does not agree with Shaler that the dislocations and elevations of the strata are due to mountain-building forces, but that they can be accounted for by the same theory that the author advanced for the modification of the strata

of Long Island and Staten Island which is to the south of former cretaceous areas, viz., that the clays have been eroded and ploughed up in masses, and the strata folded or squeezed up and shoved ahead by an advancing ice-sheet, which, upon melting, left them as hills or ridges of dislocated, contorted material covered by the englacial and super-glacial till. (Trans. N. Y., Acad. Sci., XIII, 1894.)

Plistocene Birds of Madagascar.—An important collection of bird bones from Madagascar has been received by the Academie des Sciences de Paris. According to MM. Milne-Edwards and Grandidier these bones indicate that at a period not remote, certaintly contemporary with man, Madagascar was inhabited by 12 species, at least, of gigantic birds, incapable of flight, but provided with immense feet. Two types are distinguished: the first, Æpyornis, comprising 8 or 9 species; the second, named by the author Mullerornis, characterized by a lighter body, and a shorter tail than the first, comprises but 3 species. The conditions under which these bones were found shows that the bird lived on the shores of water, with troups of small hippopotami, crocodiles and turtles. (Revue Scientifique, Jan., 1894.)

Antennæ in Trilobites.—In the American Journal of Science, August, 1893, Mr. W. D. Matthew puts on record the important discovery of antennæ in *Triarthrus beckii*, and gives illustrations of a number of this species showing these appendages. The specimens were collected by Mr. Valiant in the Hudson River shales near Rome, N. Y. Walcott suspected an antennal system in the Trilobites, and looked for it by means of sections, but failed to find a trace.

In discussing this valuable addition to biological knowledge, Mr. H. M. Bernard (Nature, Oct. 12, 1893) refers to the appearance and position of the antennæ as described by Mr. Matthew and draws the following conclusions:

"(1) All trilobites had antennæ, which except, as far as we know, in the case of *Triarthrus beckii* alone, remained shut in under the head shield.

"(2) These ventrally placed antennæ were inserted, approximately, one on each side of the labrum.

"It seems to me that these natural conclusions from the facts go far to establish the relationship originally maintained by Burmeister, and recently elaborated by the present writer (The Apodidæ, Nature Series, 1892). But however weighty the arguments (amounting, it seemed to me, to a proof) in favor of this relationship, the inability actually to

demonstrate the existence of the antennæ was a felt weakness. That weakness has now been finally removed, and my arguments have been fully confirmed by the finding that the Trilobites had antennæ in practically the same position as the anterior pair in the Apodidæ.

"The Trilobites may, therefore, take a firm place at the root of the Crustacean system, with the existing Apus as their nearest ally."

Development of the Brachial Supports in Dielasma and Zygospira.—Some interesting results have been obtained by Messrs. Beecher and Schuchert in studying the development of the brachial supports of the Terebratellidæ. Some of the latest are embodied in a paper published in the Proceeds. Biol. Soc. Washington, 1893, in which the authors show that the most primitive form of the loop in the Ancylobrachia is centronelloid and that therefore Centronella represents a larval or immature condition of the higher genera. For demonstration the authors use the paleozoic species, *Dielasma turgida* and give drawings of six sections to show the development of the loop.

It is also shown that in *Zygospira recurvirostra* the primitive arm support is a terebratuloid loop having a Centronella form, which undergoes several modifications before the growth of the spiral lamellæ, in so far resembling the development of Dielasma. The spirals then develop as two slender converging lamellæ, curving toward the ventral valve, originating from the outer pointed ends of the loop. When maturity is attained there are about three volutions in each spiral cone. Sectional drawings illustrate this series of changes.

Zygospira is the earliest spire-bearing genus known, and from the study of the ontogeny and phylogeny of its species the authors conclude that the Ancylobrachia are older and more primitive than the Helicopegmata.

According to the authors these results throw doubt on a number of Lower and Upper Silurian species described as having recurved loops and previously referred to Macandrevia or Waldheimia. The facts indicate that *Waldheimia mawii*, described by Davidson, is the young of *Davia navicula* Sowerby.

Geological News.—Mesozoic.—In a recent journey across the plateau of Shan-si, China, Mr. Obrucheff discovered some fossil plants in the middle parts of the series of deposits which cover in China, the carboniferous formation, and which Richthofen had described under the names of *Meberkohlen-sandsteine* or *Plateau-sandsteine*. These plants indicate that the middle portions of this formation belong to the Mesozoic age, and are Triassic or Liassic. (Nature, Jan., 1894.)

In a report on the Cretaceous area north of the Colorado Mr. J. A. Taff shows the detail of stratigraphy in four sectional views which give a concise view of the variations in thickness and structure and the relations of each division and formation to its associate divisions or formations, from the Brazos river on the south to the Red river valley on the north. Some attention is given to the soils of this region, and considerable definite information concerning the artesian water supply. The stratigraphic work is largely based on the paleontological determinations of Prof. F. W. Cragin.

Prof. Cope recently described two new species of Plesiosauroids from the Pierre formation of the Upper Cretaceous of South Dakota, under the names *Embaphias circulosus* and *Elasmosaurus intermedius*. The first named represents a new genus allied to Pliosaurus, having a short neck and strongly biconcave vertebræ. He also described the construction of the posterior part of the skull in another Plesiosauroid, the *Cimoliasaurus snovii* of Williston, showing that the supratemporal and supramastoid bones are both present and distinct. (Proceeds Amer. Philosoph. Soc.).

CENOZOIC.—As to the origin of certain hydrocarbons of Utah, Mr. M. E. Jones considers the theory of an animal origin advocated by Newberry to be the only tenable one. The deposits with one possible exception, are all either Eocene or Miocene, and their source, according to the author, being the overlying or adjacent bituminous beds. These remarks apply only to the deposits situated near the coal beds of Utah in the neighberhood of Pleasant Valley Junction. (Science Dec. 1893.)